

Q - Series Boiler

Troubleshooting Manual



WARNING

There are a number of live tests that are required when fault finding this product. Extreme care should be used at all times to avoid contact with energized components inside the product.

You MUST be a qualified service person before proceeding with these test instructions.

Before checking resistance readings, turn off power source to unit and then isolate each item to be checked from the circuit by unplugging it.

When setting gas pressures on one of these units, please check the complete model number you are trouble-shooting. Gas pressures and dip switches can vary among models. Always check the rating plate for complete information and follow directions.



CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

If any of the original wire as supplied with the appliance must be replaced, it must be replaced with type 18 AWG wire or its equivalent.

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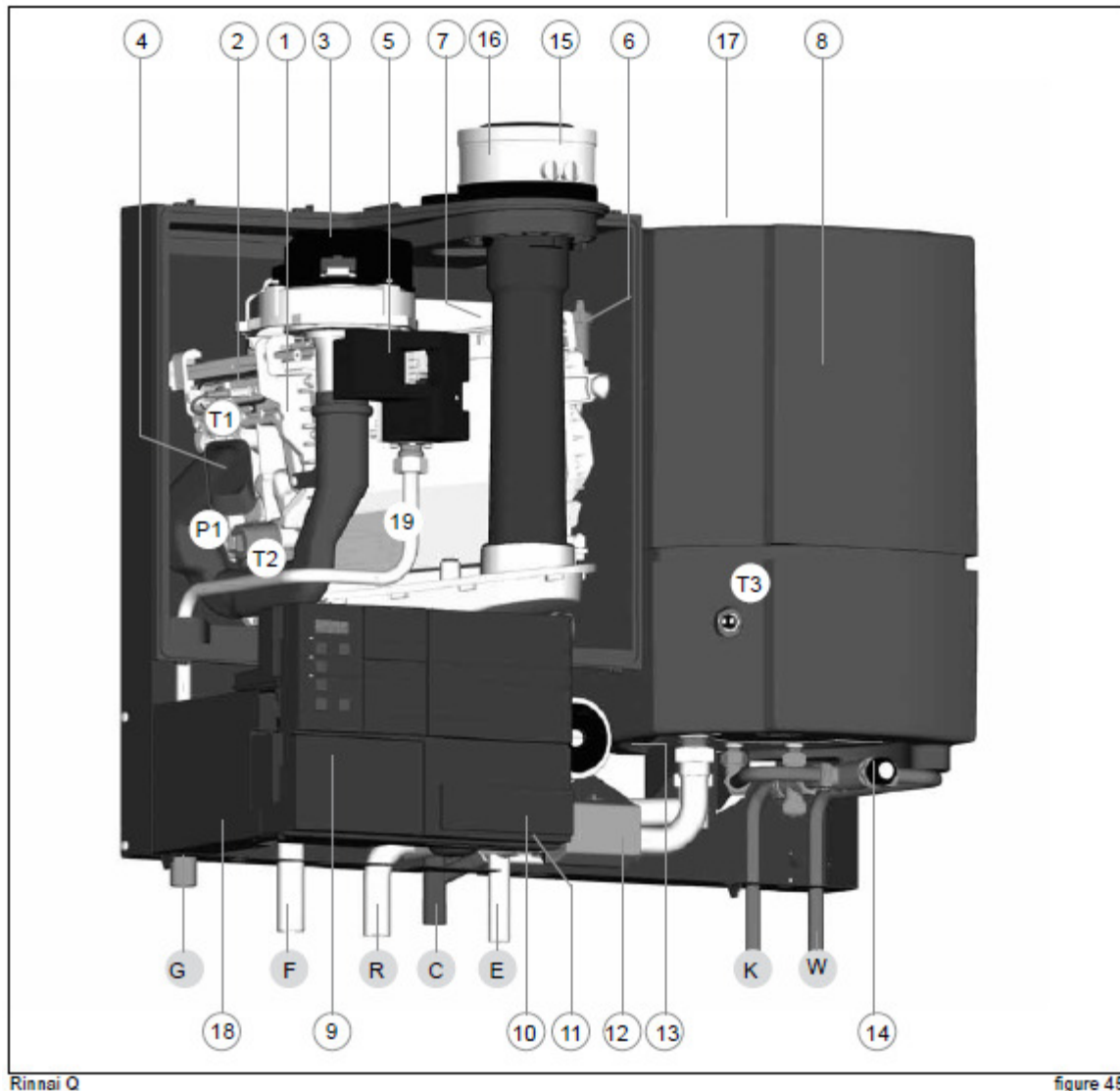
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Rinnai is continually updating and improving products; therefore, specifications are subject to change without prior notice. Local, state, provincial and federal codes must be adhered to prior to and upon installation.



1 heat exchanger	9 operating panel	16 combustion air supply
2 ignition unit	10 Control Tower (CMS)	17 air box
3 fan unit	11 water filter return CH	18 CSA Data Plate (serial number)
4 air inlet damper	12 three-way valve (Q175C)	19 ASME / NB / CRN data plate
5 gas valve	13 circulation pump	
6 automatic de-aerator	14 thermostatic mixing valve (Q175C)	
7 ceramic burner cassette	15 exhaust	
8 DHW tank (Q175C)		
T1 flow sensor	G gas pipe	K cold water pipe (Q175C)
T2 return sensor	F flow connection central heating	W hot water pipe (Q175C)
T3 DHW tank sensor (Q175C)	R return connection central heating	
P1 water pressure sensor	C condensate pipe	
	E expansion tank pipe (Q175C)	

Block and Errors - Error indication (short reference)

A detected error is indicated on the display by means of a blocking or error messages. A distinction should be made between these two messages due to the fact that a blocking code can be of a temporary nature, however, error messages are fixed "lockouts" or hard lockouts. The control will try its utmost to prevent a lockout and will temporary switch off the unit by blocking it, below is a list of some messages the unit will display.

Blocks: **bL** with a number in the last two positions indicates the type of blocking code.

bL 01 Block 01: External safety contact cut off.

bL 05 Block 05: Outdoor reset sensor not connected.

bL 60 Block 60: Incorrect parameter setting of the minimum or maximum power (Btu) of boiler.

bL 67 Block 67: A ΔT has been detected between flow and the return sensor whereas the burner is not in operation. After the ΔT has disappeared the block will clear itself.

bL 85 Block 85: The control has not detected water flow. The venting cycle (pro-purge) cycle has started. If during this cycle water flow is detected, the pro-purge cycle stops, the burner will then fire up.

Error: **E** with a number in the last two positions indicates the type of error code.

E 00 Error 00: Poor flame forming.

E 02 Error 02: No flame forming.

E 04 Error 04: Adjustment or error due to voltage interruption.

E 05 Error 05: Adjustment.

E 12 Error 12: High limit stat.

E 18 Error 18: Maximum flow temperature exceeded.

E 19 Error 19: Maximum return water temperature exceeded.

E 28 Error 28: Fan revolutions not being measured by control board. Flame present when burner is off, electrical interference, poor ground, and flame sensing wire disconnected during off cycle.

E 69 Error 69: No or incorrect display.

FUSE FUSE: 24 V fuse defective or blown.

Operation Indication

0 - No heat demand

1 - Fan pre/post purge

2 - Ignition phase

3 - Burner active on central heating

4 - Burner active on DHW

5 - Fan check

6 - Burner off when either DHW or room thermostat is calling *
(See note 2 below).

7- Pump overrun phase for central heating

8- Pump overrun phase for hot water

9 - Burner off because of too high flow temperature

A - Automatic de-aeration program

F – Fan test still activated in Service mode

H Burner test still activated in Service mode

*Note 2; (E Boiler) a continuous code 6 can mean there is a small hot water leak triggering the plate heat exchanger sensor to call continually for DHW in turn locking out space heating in DHW priority. Switch PARA 36 to 20 (flow switch only) and then repair leak.

NOTE; if the unit appears to be fine but doesn't run and no error code is displayed check;

- That the desired programming is on; set to either Central Heating and/or Domestic Hot Water.
- The unit is not in the Showroom Mode

Explanation of T Sensors:

T1 - Supply sensor - Water leaving heat exchanger mounts in flow of water.

T2 - Return water sensor, surface mounted.

T3 - Domestic hot water flow sensor,. Q175C uses a surface mount sensor. Q models with optional 3-way valve use a sensor designed to be used in a well. (QP uses a well)

T4 – Outdoor reset sensor, mounted outside building.

T5 - Flue gas sensor - Optional sensor not included with boiler.

6L01



external safety
contact is open

The 120 volt external pump is for
E and QP model boilers

Rectify error by determining which external
contact is open. If external contacts are not being
used place jumper across terminals 24 & 25

Connection terminal Q-Series																										
120 V~ Power supply			120 V~ External pump			120 V~ Ext. controller			120 V~		80352200						Outside sensor		Bus Controller		Room therm. On / Off		External safety contact		24 V~ 100 mA	
N	L		N	L		N	L		N	L	CH	DHW	N		DHW sensor				A	B						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23			26	27
main power supply			120 Volts for external pump			120 Volts for external control			120 Volts		internal or external three-way valve motor and tank sensor						ARV12 outdoor sensor		Bus room thermostat		On/off thermostat or control (Volt free)		External safety contact		24 Volts maximum 100 mA	

CAUTION

CAUTION
Make sure that the power consumption of each of the terminals
4-5-6, 7-8-9 and 10-11 does not exceed 230W or 2 Amp.

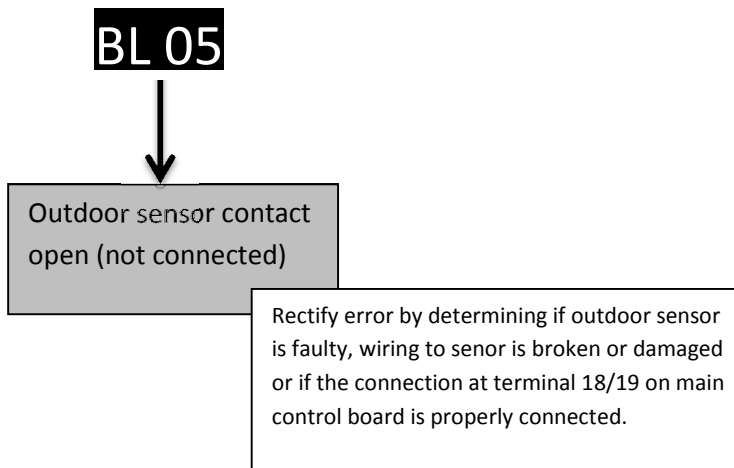
If multiple boiler safeties are to be wired in series check with your local inspector or the local or State codes to see if this is allowed in your area before proceeding. NEVER wire boiler safeties in parallel.

Refer to wiring diagram in the boiler manual. Trace connections 24 and 25 above back to the MCBA. These will be located on Plug X5 on the MCBA on pins 2 and 6.

A new blocking code is now present in all boilers and MCBA's manufactured after September 1, 2012. The new code is a bl05, blocking 05: Outdoor sensor contact open (outdoor sensor not connected). This code will not prevent the boiler from operating; it will however be displayed until an outdoor sensor has been reconnected to the boiler or a resistor has been placed in the outdoor sensor terminals.

An outdoor sensor is not required for the boiler to operate. If no outdoor sensor is present the boiler will operate as it has in the past as a limit boiler, with the only difference being a bl05 code will always be displayed. A jumper wire should not be installed because this will cause the boiler to see an outdoor temperature of 230°F and force the boiler into summer setback. If nothing is connected to the outdoor sensor terminals then the temperature will be seen as -22°F. If no outdoor sensor is connected to the boiler the boiler will still go through the de-aeration cycle as long as either the heat or hot water program has been activated.

A resistor value can be selected from the tables in Appendix A and B in the back of the manual. When the bl05 code is present the water temperature cannot be viewed by pressing the step button on the boiler pressure, nor can the technical readout status be viewed (0 to 9 or A). When performing maintenance, trouble shooting, or starting up and commissioning the boiler, to view the technical readout and water temperature a 100k ohm resistor should be placed in the outdoor sensor terminals. When a 100k ohm resistor is installed on the outdoor sensor terminals Info 7 which is the outdoor temperature will read -6°F.



BL 11

Maximum average ΔT of T1 supply sensor and T2 return sensor for central heating is repeatedly exceeded.

Operation is normally possible for the hot water supply during the block. The pump continues to operate at minimum capacity during the block.

Rectify Issue,
Check following

1. Check flow through the heating system.
2. Possible causes: radiator shut off valves closed, blocked water filter.
3. Verify proper installation of the boiler plumbing, connections and all components.
4. Check minimum and maximum temperature difference in Parameter step 46 and 47.
5. Activated room sensor (RS100) in non leading room (closed thermostatic radiator valves?) Check pump height. Should this be check pump head? **Do not understand**

BL 12



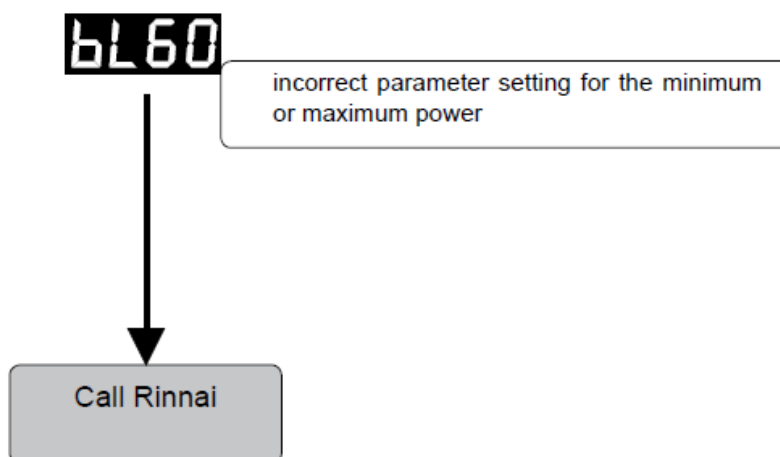
Maximum average ΔT of supply sensor and return sensor for hot water is repeatedly exceeded.



Rectify Issue,
Check following

Operation is normally possible for the central heating installation during the block. The pump continues to operate at minimum capacity during

1. Check flow through the boiler and DHW tank.
2. Possible causes: radiator shut off valves closed, blocked water filter, restriction in DHW tank to high.
3. Verify proper installation of the boiler plumbing, connections and all components.
4. Ensure 3 way valve is functioning properly and is not clogged or full of pollution.



NOTE; in order to reset all parameters in your boiler back to factory defaults follow the “Activating Factory Settings” (Green button function) instructions found in your owner’s manual. **CUATION: All parameters you adjusted will now have to be reprogrammed** if the bL60 code clears up. If after resetting the boiler the bL60 still appears, you will need to replace the sub-PC board and reprogram the MCBA. The sub PC board must be from a conversation kit for the same gas type as your boiler.

If conversion parts are not locally accessible contact Rinnai Tech Support for assistance. These parameters cannot be accessed in the field and may require special instructions in an emergency situation.

bL67

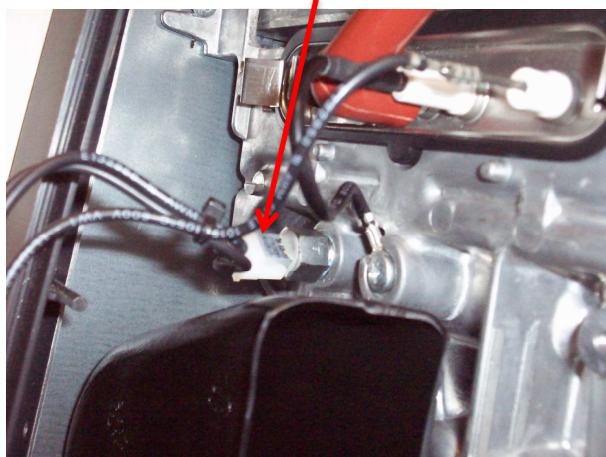
A temperature difference has been detected between the supply T1 sensor and the return T2 sensor while the burner is not in operation. After the average ΔT has disappeared, the blocking code will go away.

check the sensors
NTC 1 and NTC 2

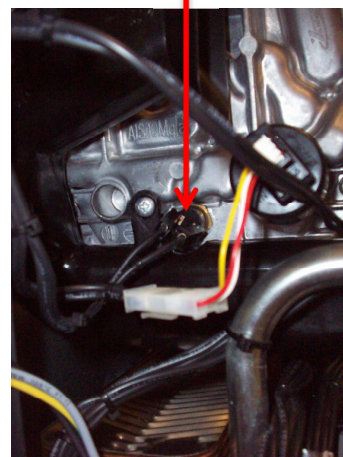
Check the supply T1 sensor and the return T2 sensor for the proper resistance value. Replace if found to be defective.

check the installation for any external heat source and rectify this

T1 Sensor



T2 Sensor



bL80

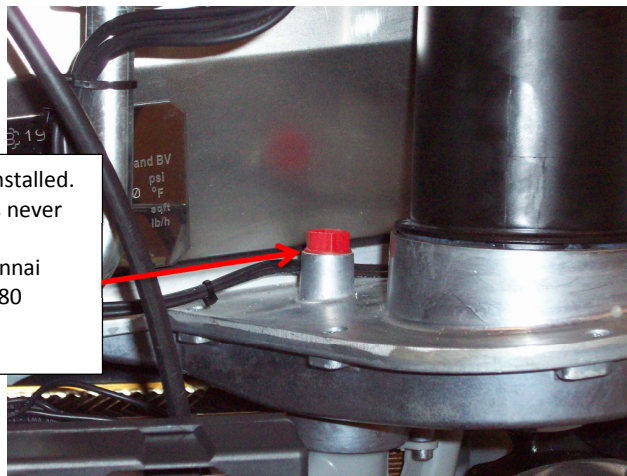
flue sensor temperature too high

Inspect vent system and all air passages
ways for blockage

212°F is the default temperature setting for
parameter 84. Verify to see if the temperature
setting for this parameter is set higher than
the default. If so, inspect vent system for
blockage.

T5 sensor is registering too high of a
temperature. This error can only occur if
the optional T5 sensor is was purchased
and installed on the boiler.

This is the location of the T5 sensor if installed.
If the red tab is in place this sensor was never
installed, which means the circuit has
somehow been jumped out. Contact Rinnai
tech support for assist if you get the bL80
without the T5 sensor being installed.



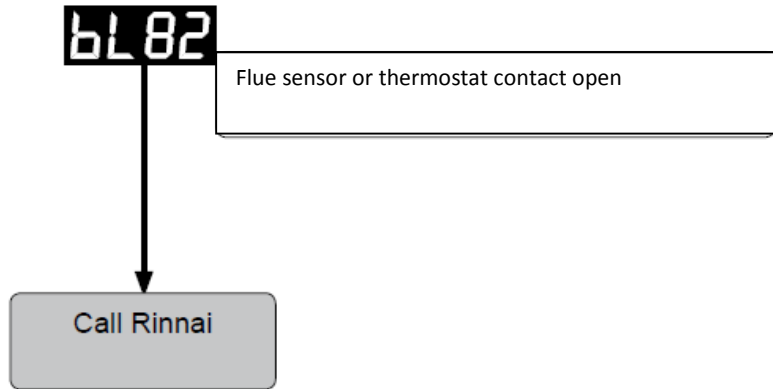
bL81

flue sensor or thermostat contact open

Explanation: The bL81 can be triggered if the flue gas plug has gotten wet and then dried out. (MCBA sees resistance when wet and then sees no resistance when dry) This tricks the MCBA into thinking that a flue gas sensor was installed and then removed in which the bL 81 is triggered. Moisture can come from a clog, broken or dry condensate trap. Moisture can be from a leaking concentric vent pipe or from driving rain during extreme weather.

Methods to rectify:

- A. ORDER AND INSTALL A FLUE GAS SENSOR (This may not be possible in cold weather when boiler must operate immediately, if shipping the part is required).
- B. CHANGE PARA 80 TO 20 AND INSTALL LOW VOLTAGE JUMPER ON FLUE GAS PLUG - (plug located on upper left hand side of the heat exchanger in the harness) (PARA 20 setting causes the MCBA to look for an open/ close circuit and ignores any variable resistance values like moisture or a thermistor).
- C. INSTALL A 10K OHM RESISTOR ACROSS FLUE GAS TERMINALS. This will make the MCBA think that the flue gas is at a safe temperature level (90 F)



6L84

flue gas thermostat contact open

This can occur on a Q Boiler when the factory jumper on the flue gas sensor is loose or has fallen out.

Check vent system
or check
parameter 84 for
default

212°F is the default temperature setting for parameter 84. Verify to see if the temperature setting for this parameter is set higher than the default. If so, inspect vent system for blockage.

BL85

no water flow can be detected through the controller. De-aeration cycle is started. When water flow is detected during this cycle, the de-aeration cycle is terminated and the burner is released.
The controller checks the water pressure during static and dynamic situation.

check the boiler pump

Check the installation for the presence of air. If there is a secondary pump installed and it is not hydraulically separated, it could cause a loss of pressure difference.

Check to ensure the pump is functioning and/or water pressure sensor is working properly.

Ensure water pressure sensor is not clogged or defective.
Inspect water filter for debris.
Check pump for proper operation and flow rates.
Check for proper wiring of pump.
Check for use of balancing valves.

AIR: if boiler, inner boiler piping, or Low Loss Header has a large air bubble in it the pressure sensor will not see the pressure spike that the pump generates when it starts. The pressure spike is what tells the MCBA that the pump has started.
The air bubble will absorb that spike. Bleed all air from the system.

If an additional expansion tank is placed in the system alongside an E-boiler that tank can absorb the pump pressure spike as well. You may need to isolate that tank to see if this corrects the issue with BL 85.

An expansion tank that is not charged properly can cause the pump's pressure spike not to be seen by the sensor causing a BL85.

Expansion tank pressure should be air charged to match whatever water fill pressure that is chosen for the closed loop. (Always above 14.5 psi)

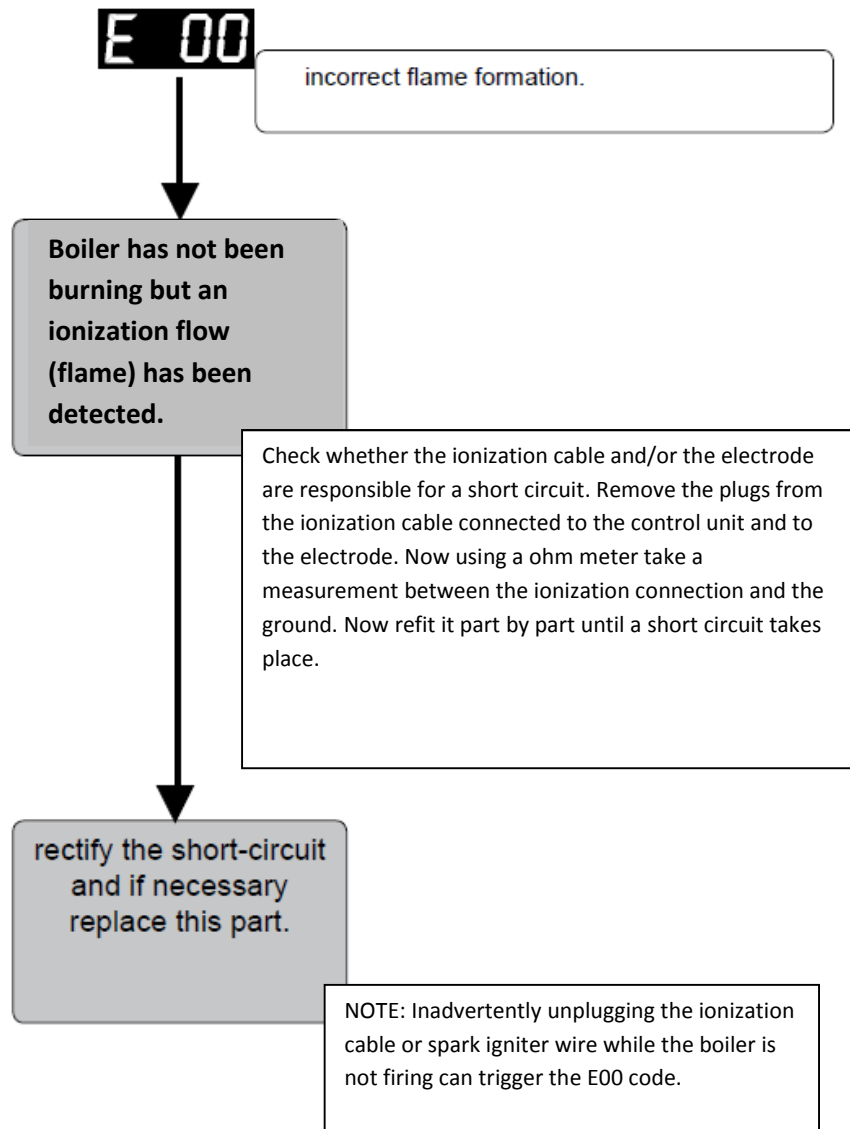
Expansion tanks must be air charged only when there is no water pressure on the wet side of the diaphragm or the tank is removed from the system. Once charged to the correct air pressure it may be placed into the system and the water fill pressure now may be set to match the new tank pressure.

6L86

The frequency of the power supply deviates more than + or - 1.5 Hz.

check the main
power supply

If using a back-up generator ensure it is properly grounded and providing a clean steady voltage and sign wave of 59.3 to 60.8 Hz.

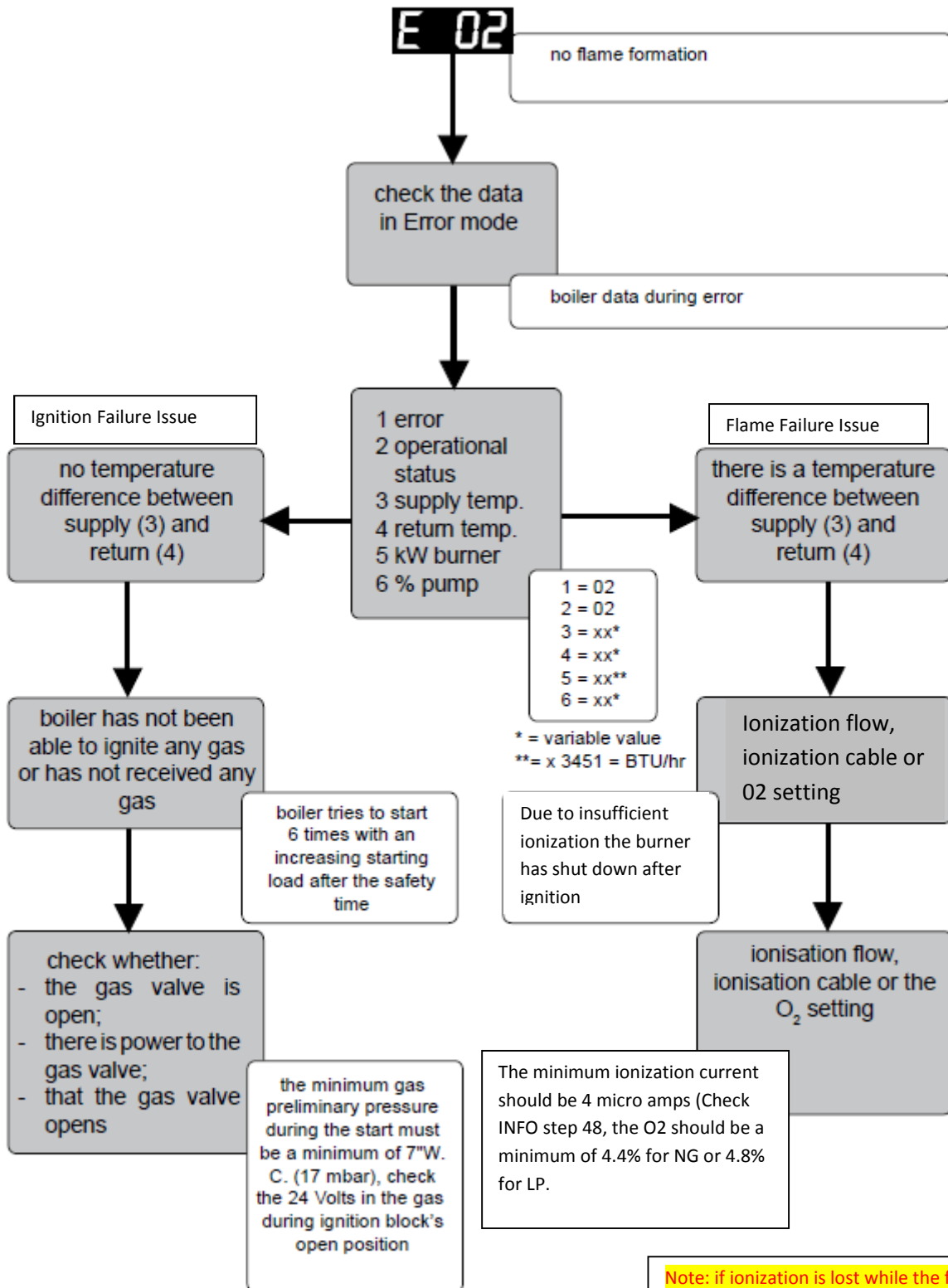


E 01



24 volt short circuit

Remove all 24 volt connectors, such as: fan, pump, any three port valve and the 24 volt plug to the connecting block. Check for a short circuit in the disconnected components. Next; switch on power to the control board with all the 24 volt components disconnected. Reconnect the components one at a time, if code E 01 appears when you plug up a component, that component has a short circuit. Rectify any short circuits or replace defective component causing short circuit.



Note: if ionization is lost while the flame is burning no E02 will occur - unit will attempt to relight 6 times. E02 only occurs after 6 failed attempts for re-ignition.

Propane gas with low BTU value or a brand new tank that may contain something other than pure propane may cause E02. Check against a good known source of gas.

E 03

Control unit error - Connector not plugged into the gas valve or defect in the wiring harness to the gas valve.

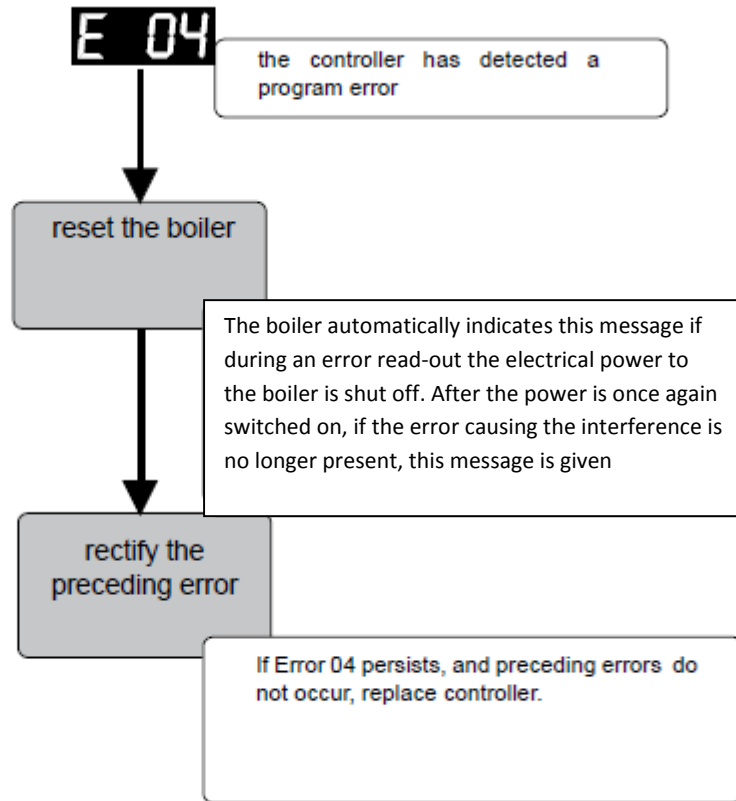
software error
control unit

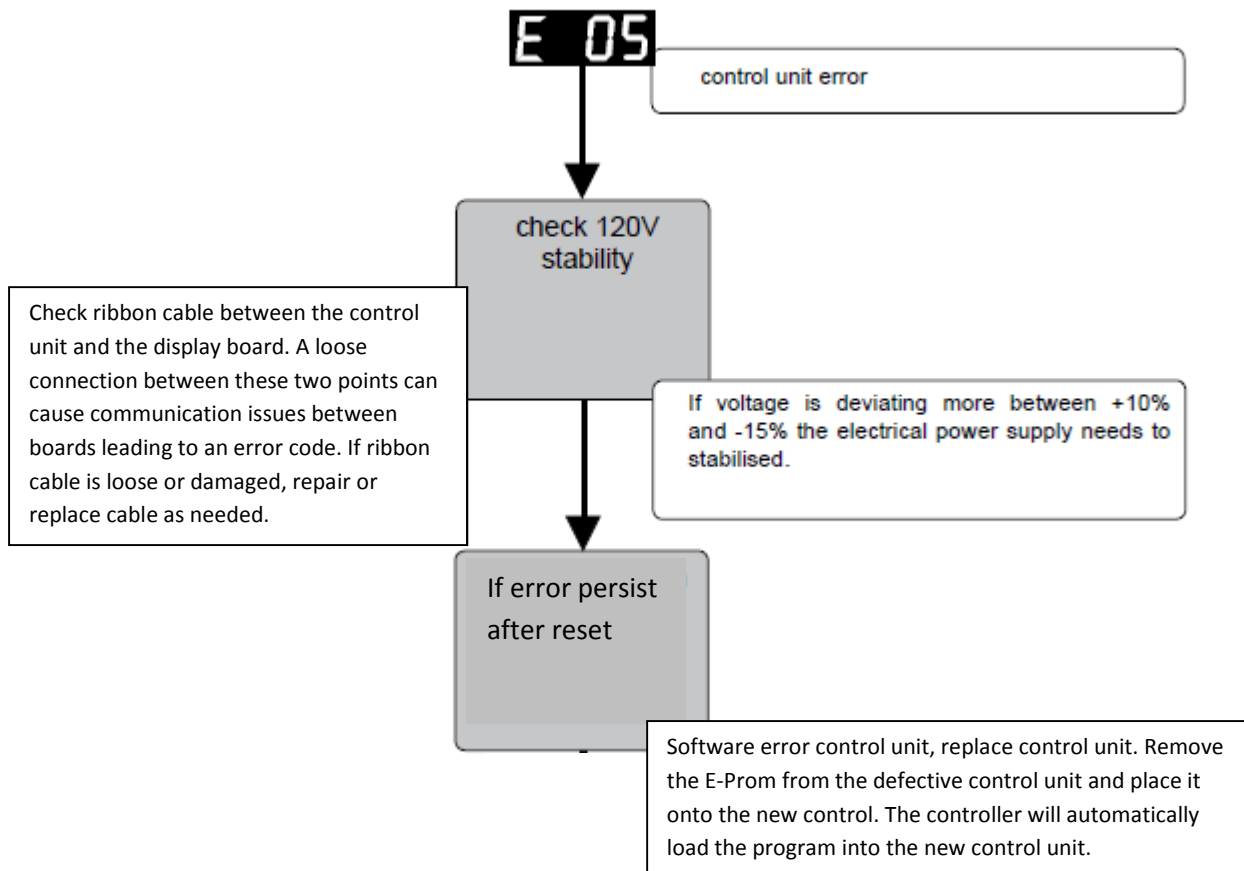
replace the control unit. The display will automatically load the program into the new controller.

Check for 24 volts DC at gas valve.

Check across terminals 4 and 5 at plug X5 on the main control board. See wiring diagram for your boiler for terminal locations

In some cases an E03 is caused from a loose connection on wires to the gas valve. This faulty connection may be in the Molex plug (X5) on the MCBA. Examine plug closely for bayonets that may have backed out of plastic casing.



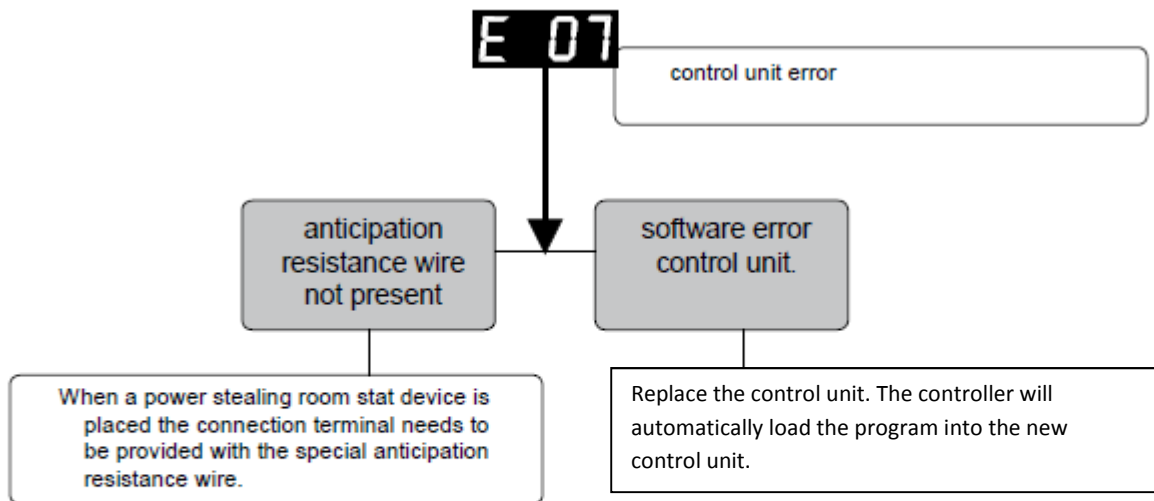


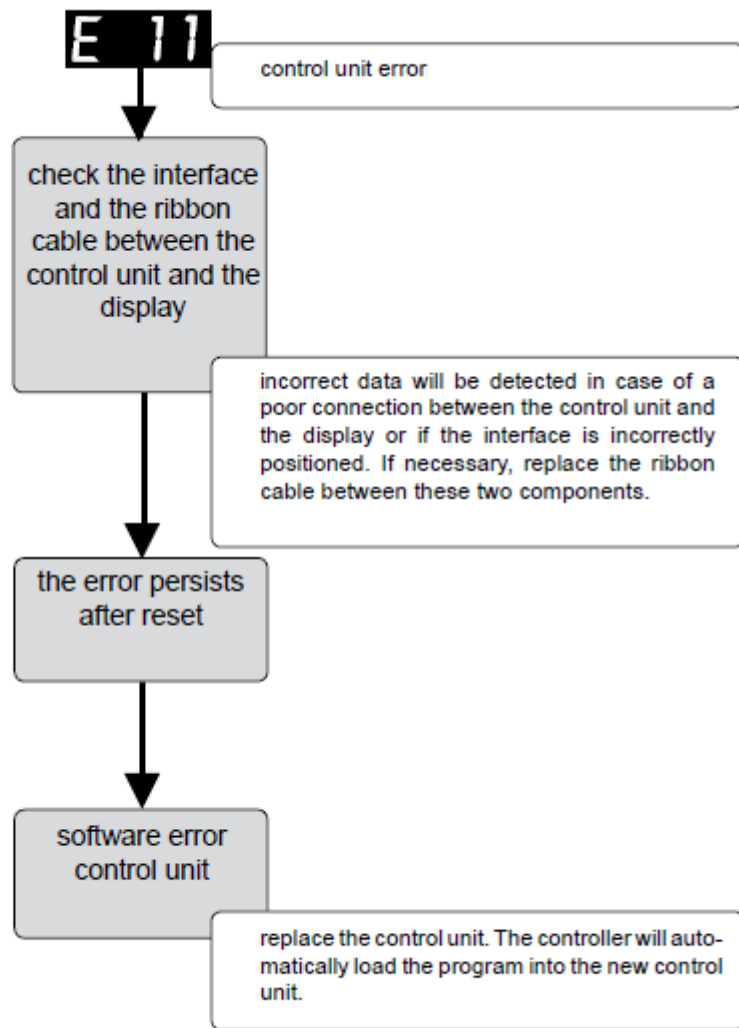
E 06

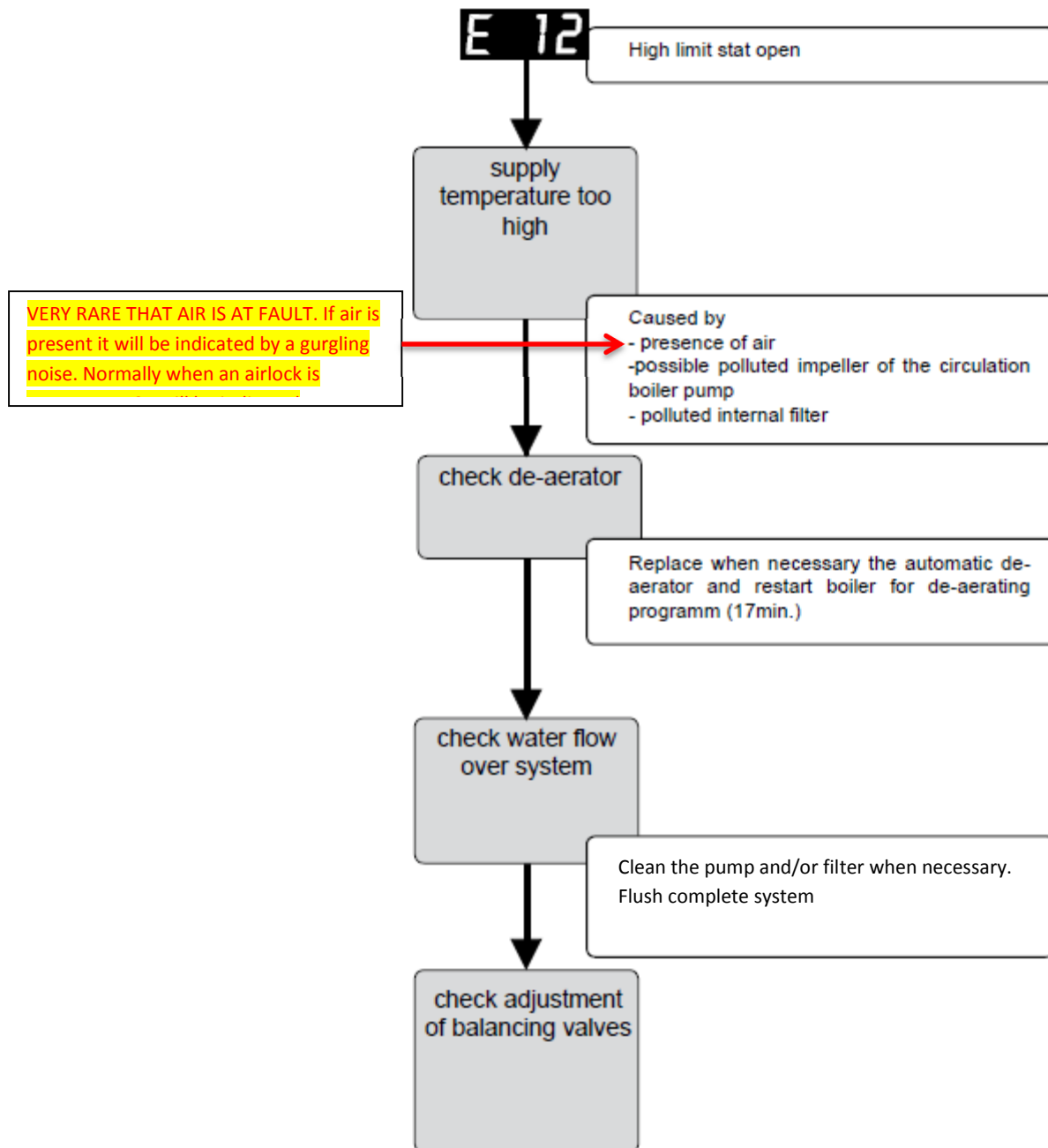


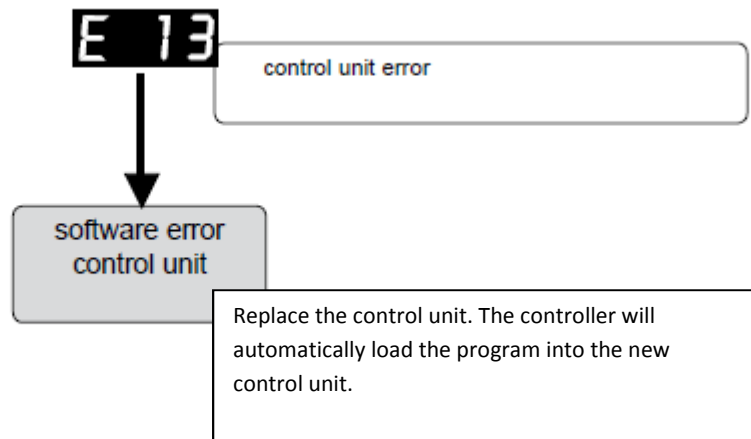
Control unit error

Moisture on the PC board, check for leaks on or in the boiler. Replace PC board if needed.





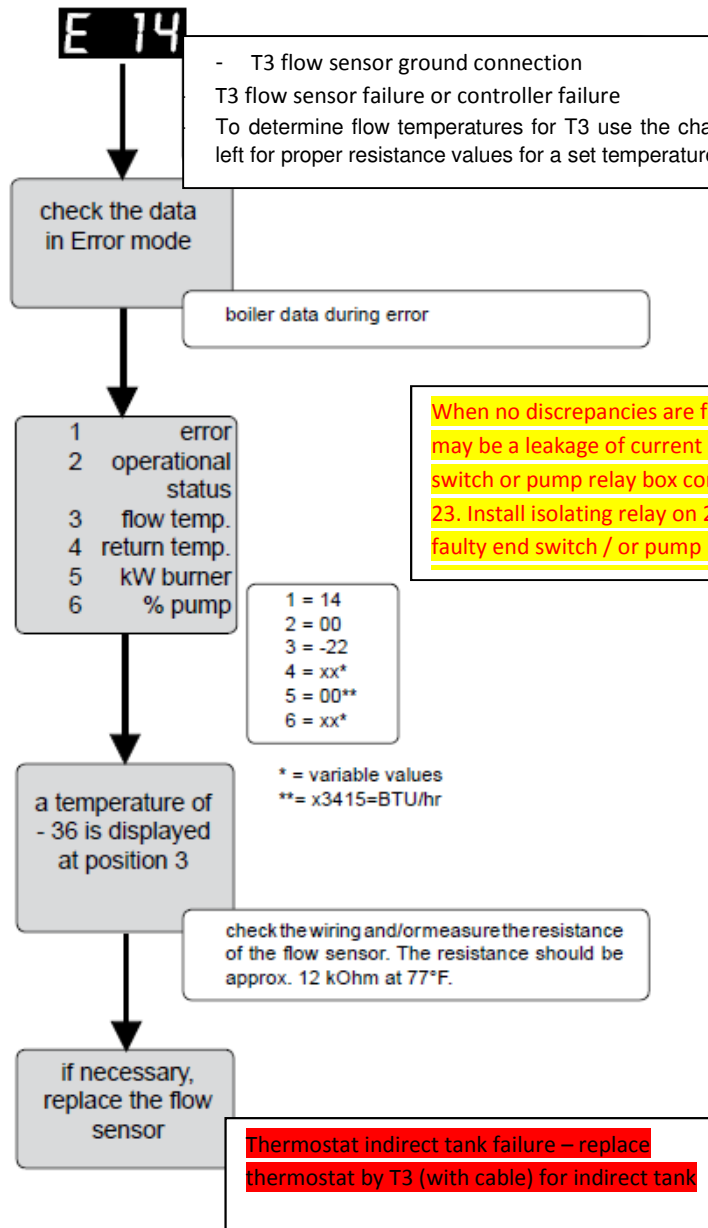




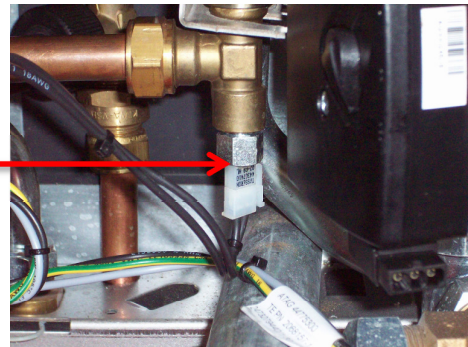
Temp °F	NTC 12K (12kΩ/77°F)
	supply sensor T1
	return sensor T2
	DHW sensor T3
	outside sensor T4
	flue gas sensor T5

-4	98,000
-0.4	90,000
3.2	82,000
6.8	74,000
10.4	66,000
14	58,000
17.6	53,500
21.2	49,000
24.8	45,000
28.4	40,500
32	36,000
35.6	33,500
39.2	30,900
42.8	28,200
46.4	25,600
50	23,000
53.6	21,400
57.2	19,900
60.8	18,100
64.4	16,600
68	15,000
71.6	14,000
75.2	12,900
78.8	11,900
82.4	10,850
86	9,800
89.6	9,100
93.2	8,500
96.8	7,900
100.4	7,200
104	6,500
113	5,600
122	4,600
131	4,000
140	3,400
158	2,300
176	1,700
194	1,300

Resistance table NTC-Sensors



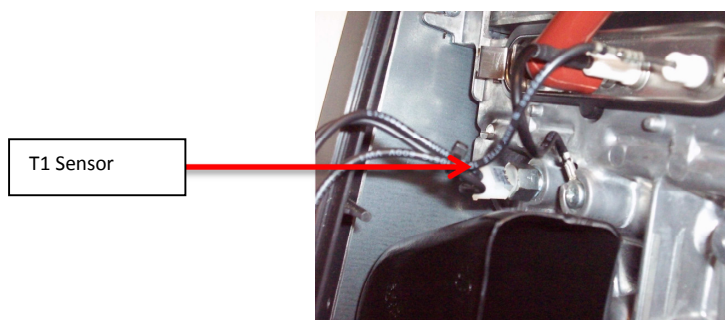
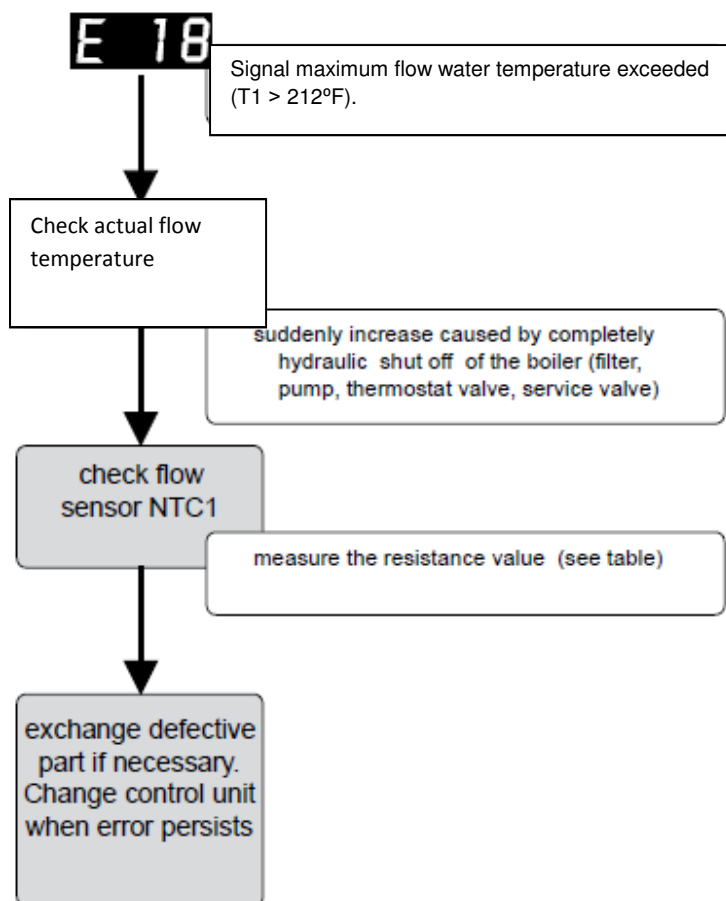
T3 Sensor is located behind the condensate trap on the E series boiler; this will look different on Q and QP boilers. This is a close up of the T3 sensor with the condensate trap removed.



Temp °F	NTC 12K (12kΩ/77°F)
	supply sensor T1
	return sensor T2
	DHW sensor T3
	outside sensor T4
	flue gas sensor T5

-4	98,000
-0.4	90,000
3.2	82,000
6.8	74,000
10.4	66,000
14	58,000
17.6	53,500
21.2	49,000
24.8	45,000
28.4	40,500
32	36,000
35.6	33,500
39.2	30,900
42.8	28,200
46.4	25,800
50	23,000
53.6	21,400
57.2	19,900
60.8	18,100
64.4	16,600
68	15,000
71.6	14,000
75.2	12,900
78.8	11,900
82.4	10,850
86	9,800
89.6	9,100
93.2	8,500
96.8	7,900
100.4	7,200
104	6,500
113	5,600
122	4,600
131	4,000
140	3,400
158	2,300
176	1,700
194	1,300

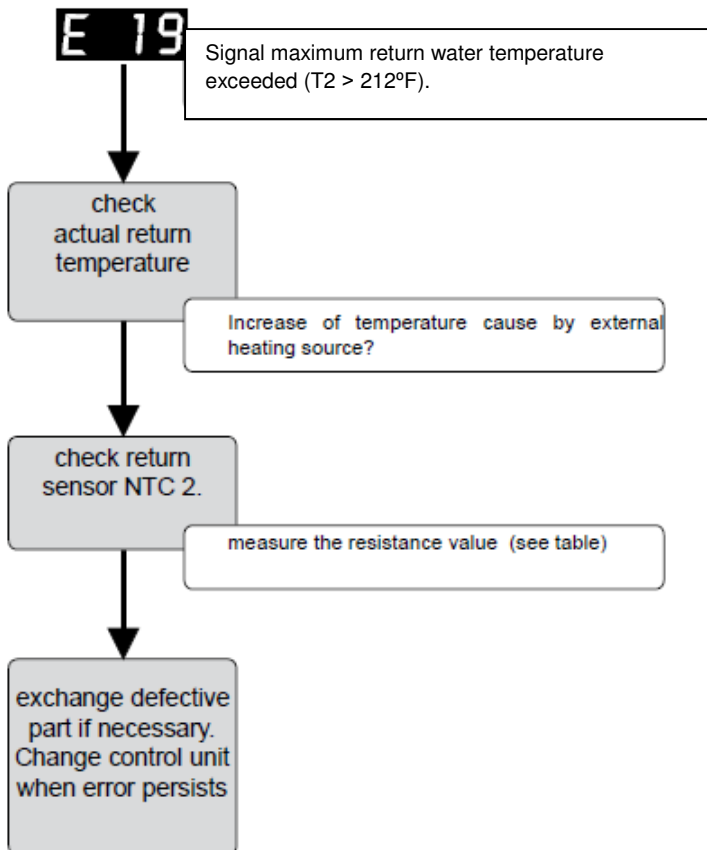
Resistance table NTC-Sensors



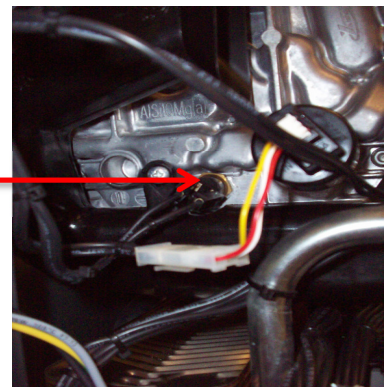
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-0.4	90,000
3.2	82,000
6.8	74,000
10.4	66,000
14	58,000
17.6	53,500
21.2	49,000
24.8	45,000
28.4	40,500
32	36,000
35.6	33,500
39.2	30,900
42.8	28,200
46.4	25,800
50	23,000
53.6	21,400
57.2	19,900
60.8	18,100
64.4	16,800
68	15,000
71.6	14,000
75.2	12,900
78.8	11,900
82.4	10,850
86	9,800
89.6	9,100
93.2	8,500
96.8	7,900
100.4	7,200
104	6,500
113	5,600
122	4,600
131	4,000
140	3,400
158	2,300
176	1,700
194	1,300

Resistance table NTC-Sensors



T2 Sensor located under T1 sensor

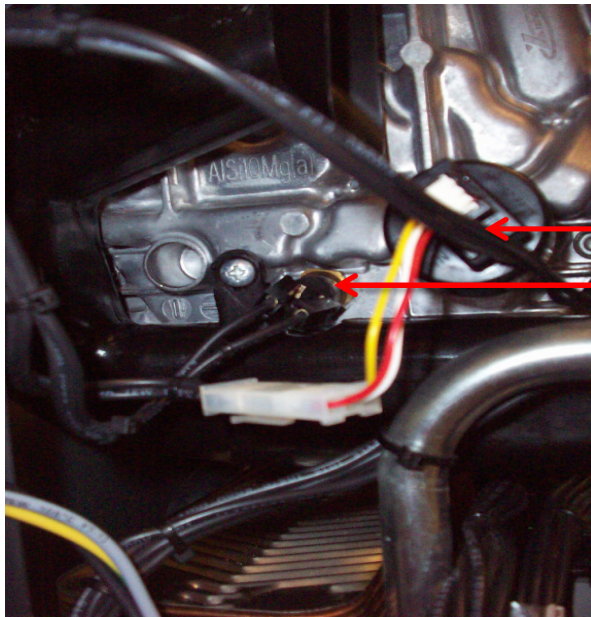


E 24

T1 and T2 (swapped).

Failure on
temperature

T2 temperature is measured to be higher than T1. Check resistance value of T1 and T2 (See resistance chart under error 19 for resistance values. Replace T1 and/or T2 if found to be defective.



T1 Pressure Transducer

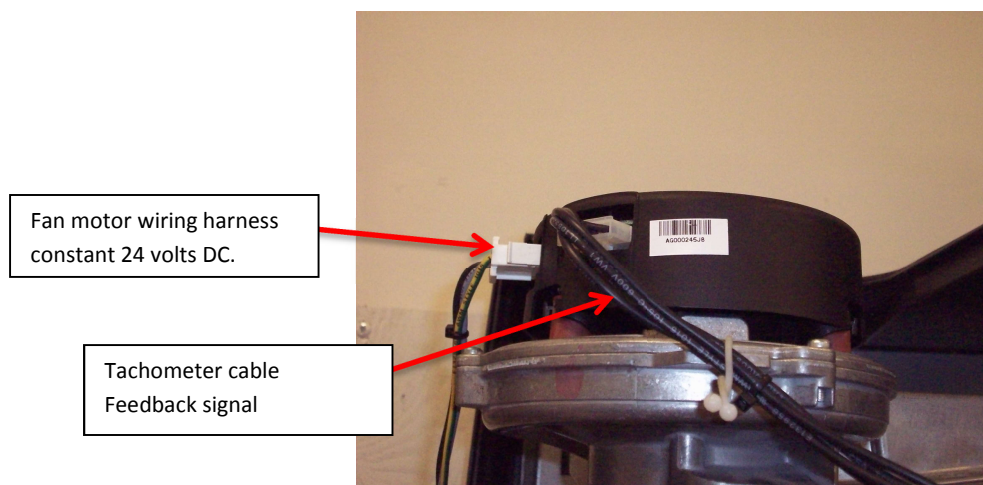
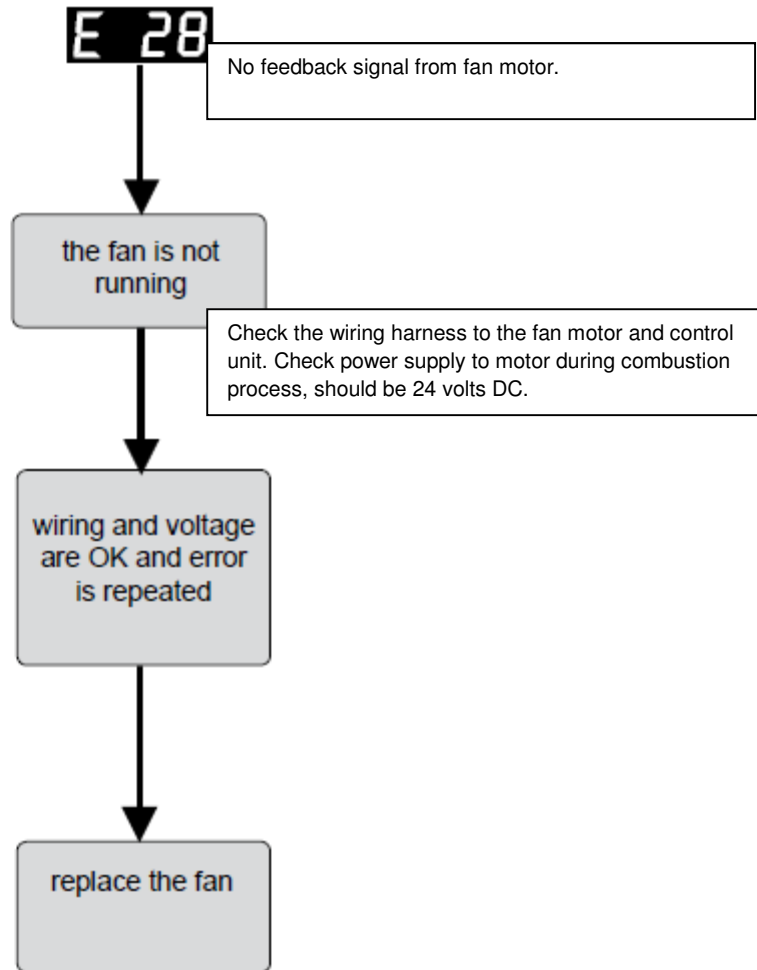
T2 sensor

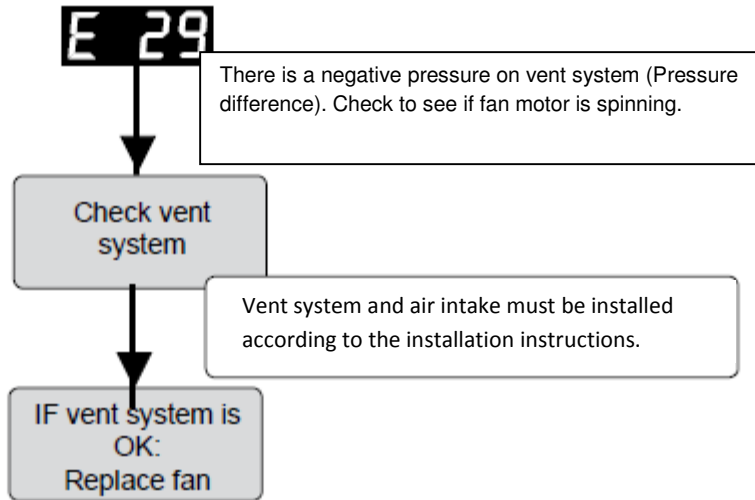
E 26

Replace MCBA board, main board.



Replace controller

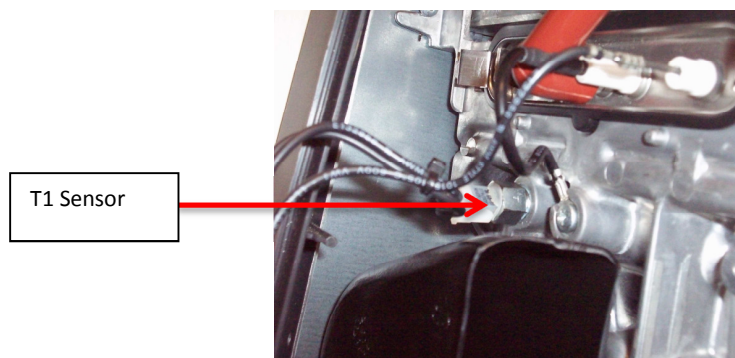
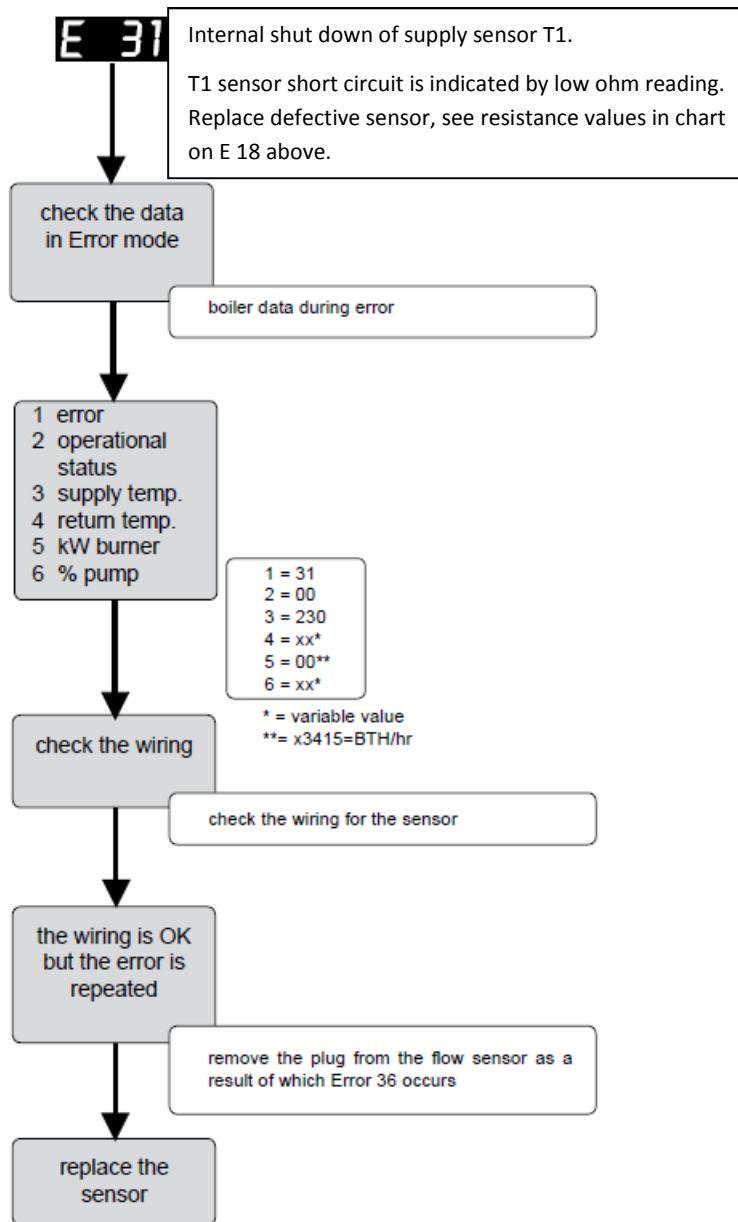


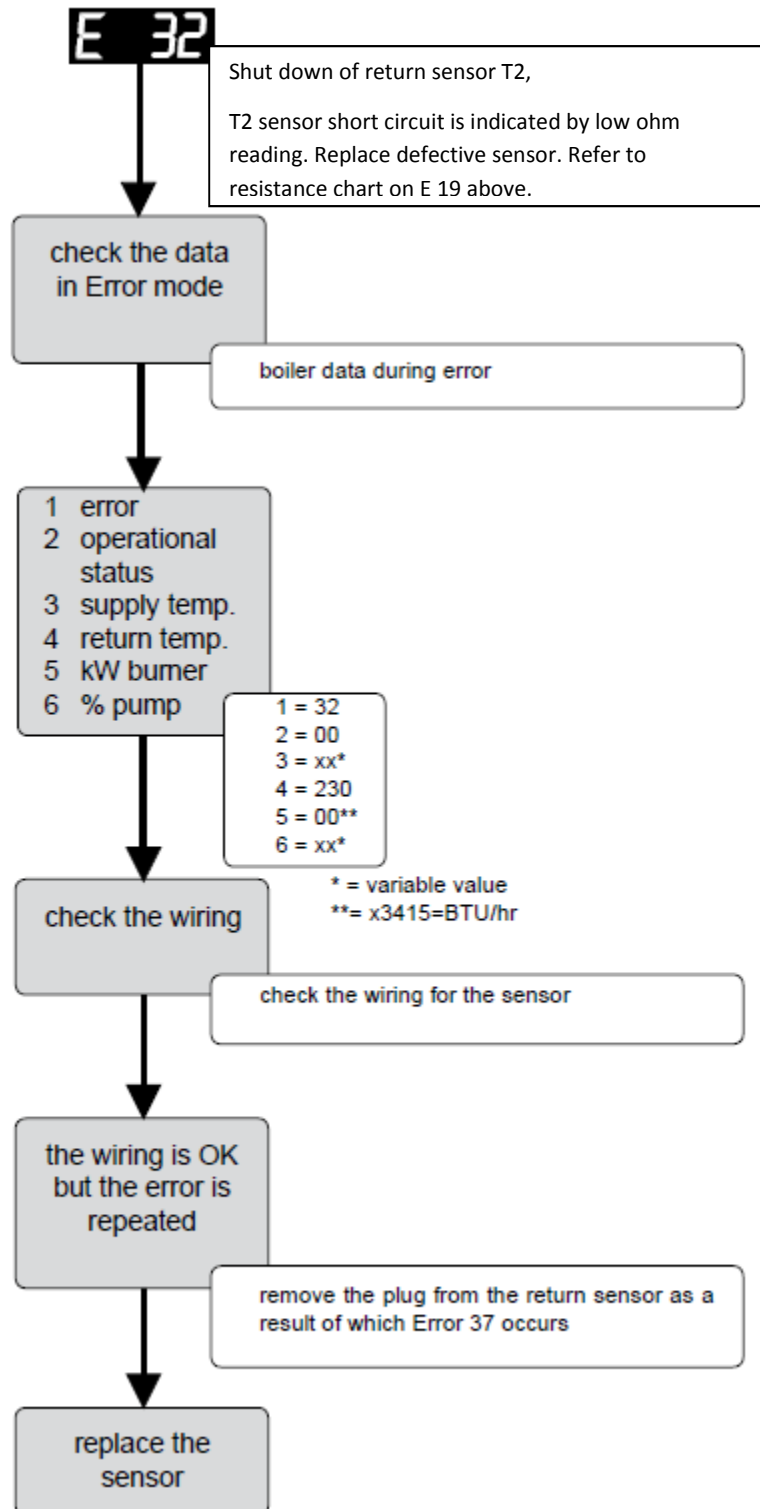


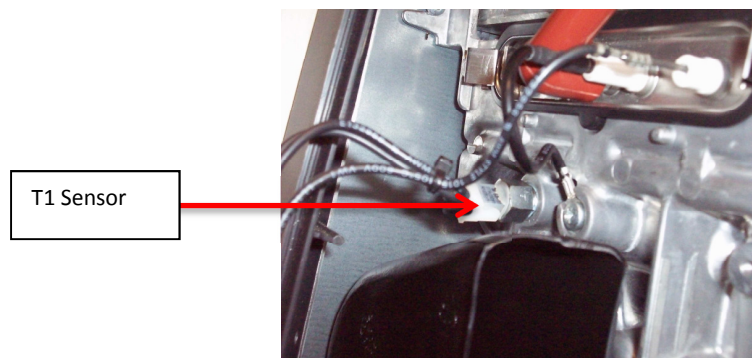
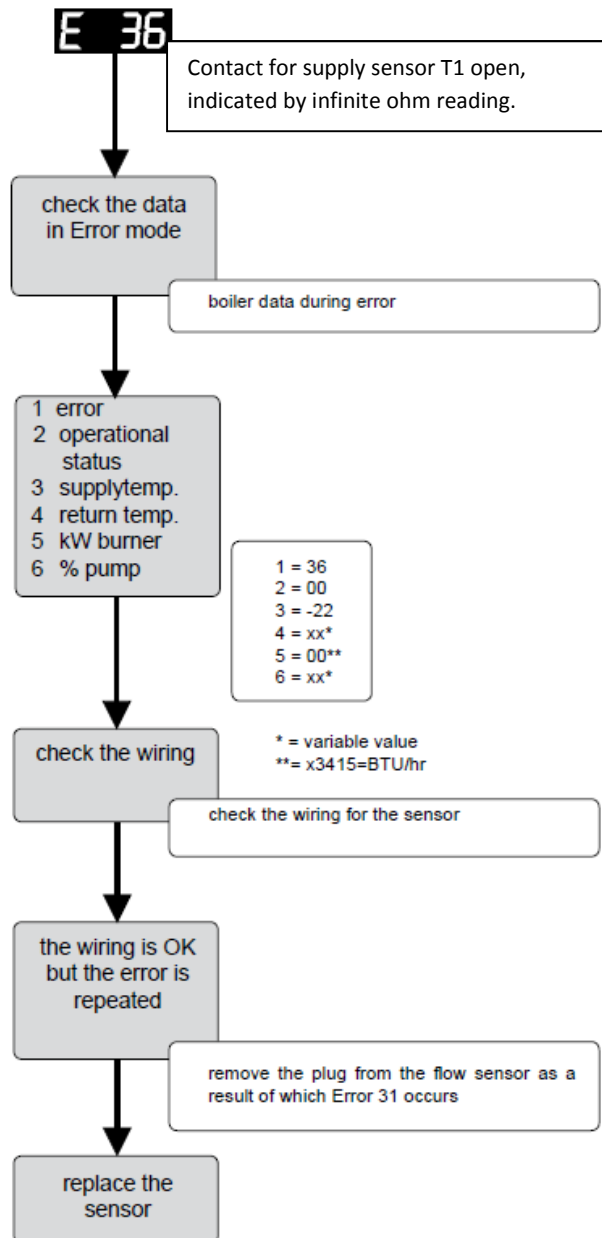
The E29 is triggered immediately after fan check code 5 during the starting sequence. If during fan check 5 the fan remains spinning more than 150 rpms an E29 will occur.

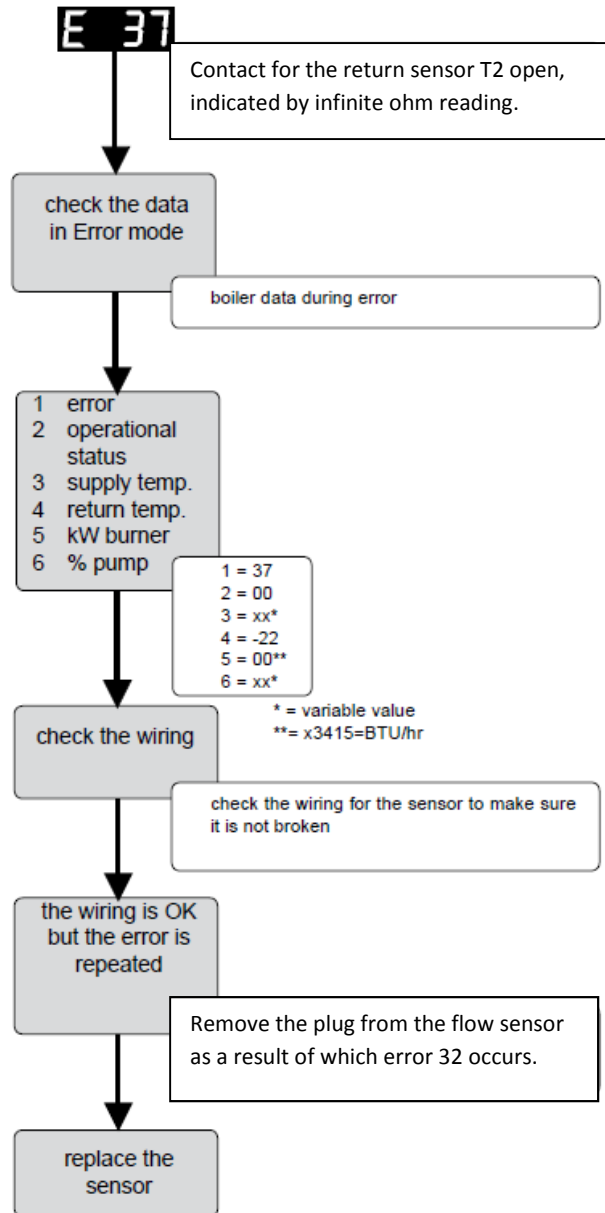
Causes:

- Wind driving into a concentric terminal. Replace with 90 degree terminal or for best results use a roof terminal.
- Venting running a long distance in a cold attic space causing a thermo syphon after fan check. Use room air for combustion if conforming to NFPA 111 guidelines for room air or use concentric terminal directly through the roof.

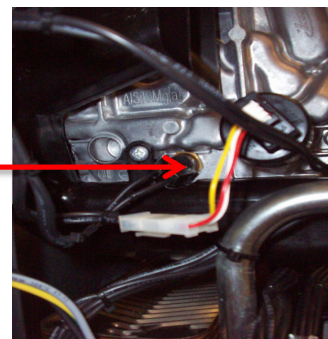


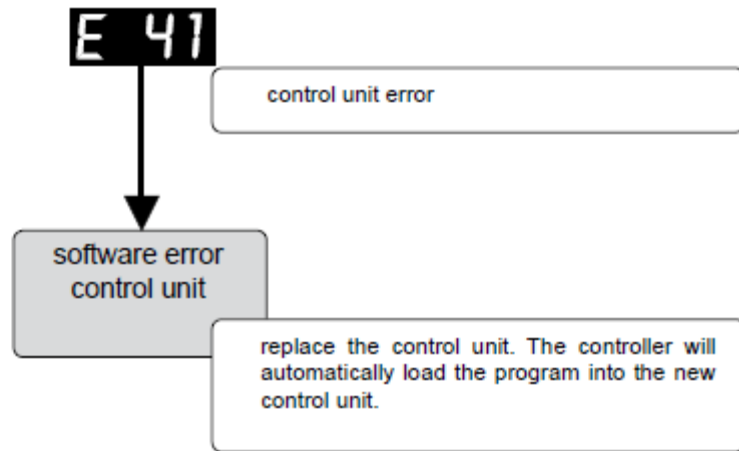


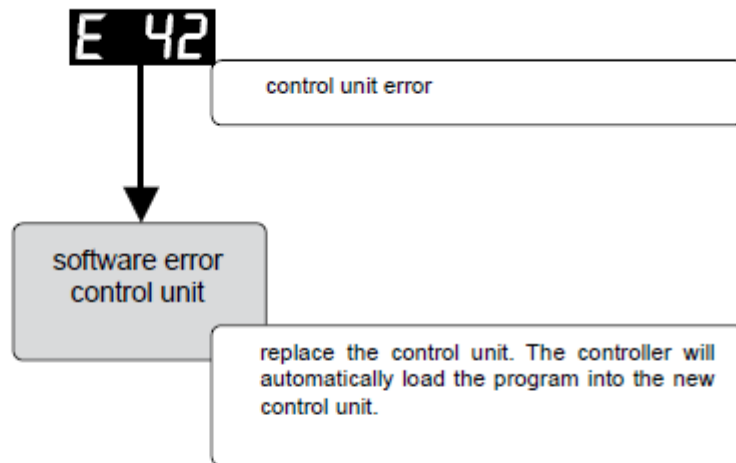


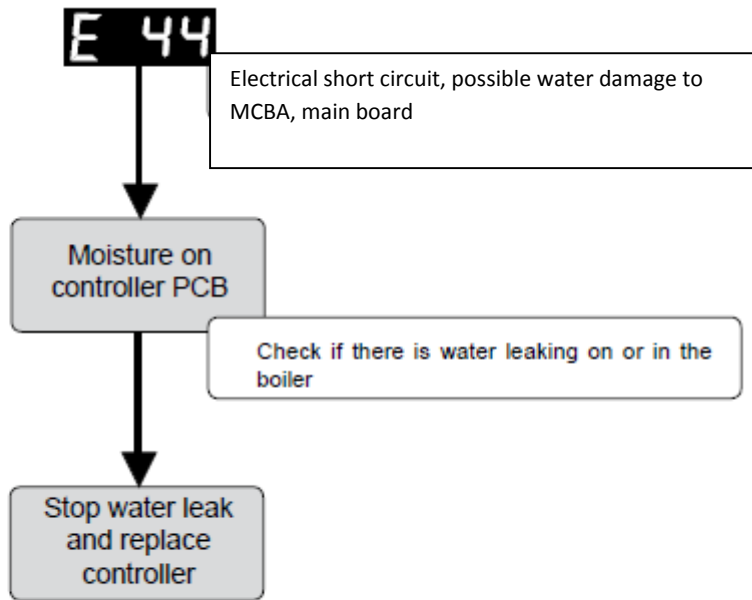


T2 Sensor









E 68

no software present

control unit and
display don't have
a program

If this error is displayed, there is no software on the MCBA or display. A RINNAI conversion kit specific for the boiler model and fuel type must be installed. Follow the conversion kit instructions to load the software to the MCBA.

E 69

Ribbon cable problem.



Replace ribbon cable

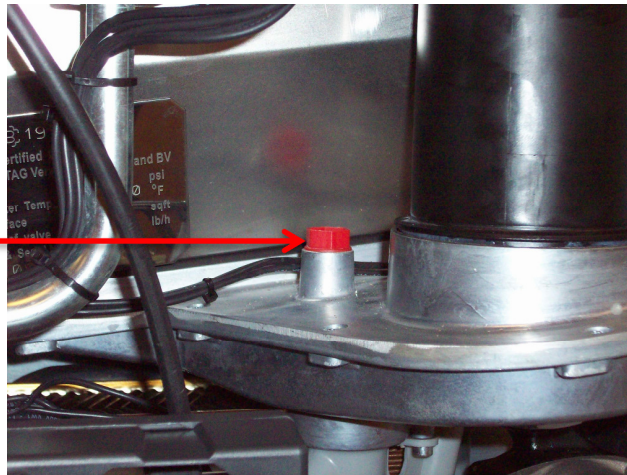
E 80

T5 sensor is reading too high of a flue gas temperature. (Adjust parameter 84 – default 212 °F) See location of T5 sensor below. If red cap is installed, T5 sensor is not being used.

Replace flue sensor or adjust parameter 84 to default

Moisture on the flue gas sensor wires or terminals could cause a false temperature reading.

T5 Sensor, if installed



E 115



Replace MCBA board




FUSE

Check fuse mounted on PC board to see if it blown. In addition, check transformer output and wiring harness for transformer to ensure it is plugged in properly.

Replace fuse

This is the low voltage fuse that is located directly next to the PCB board transformer. The OEM fuse has colored stripes; the spare fuse located on control cover is a clear glass. Please verify the amp rating (4 amp) on the metal rim of the fuse before installing it. It must be the same amperage as the fuse being replaced.

Additional Troubleshooting Instructions

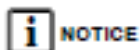
Complaint	Description	Solution
Central heating but no domestic hot water	1.  -Key of the DHW program is not switched on	Switch on DHW program on the Control Tower
	2. Flow switch is not working properly.	Check flow and/or check for impurities. Check on functioning. Replace if necessary.
	3. T3 DHW sensor in plate heat exchanger defective	Replace DHW sensor
	4. When using RS100	<ul style="list-style-type: none"> - Check timer times for DHW program, if necessary reset - RS100 does not respond to DHW program - See RS100 installation instructions
	5. Three-port valve is not circulating to DHW	<ul style="list-style-type: none"> - Check wiring. - If necessary replace the three-port valve motor.
Hot water but no central heating	1.  -Key of the central heating program is not switched on.	Switch on central heating program
	2. Room thermostat (on/off) is not giving any signal to the boiler.	Check room thermostat
	3. RS100 with outdoor sensor (Room sensor-On)	<ul style="list-style-type: none"> - Outdoor temperature is higher than 70°F, depending upon the Eco-temperature set (70°F is the default). Check Info chapter Step 7 or temperature is higher than the Eco temperature set (see RS100 installation instructions). - Check timer program and set room temperature.
	4. Three-port valve is not circulating to central heating position.	Check wiring, replace the three-port valve motor.
Central heating installation gets hot without being requested	1.  -Key pump program is on.	Switch off.
	2. Dirt in three-port valve or three-port valve cartridge is binding.	Clean or replace.

Insufficient quantity of hot water	1. Hot and cold water connection to the boiler mixed up.	Check left = hot, right = cold
	2. Incorrect flow reducing valve.	<ul style="list-style-type: none"> - Check for the type and for contamination, if necessary replace (Combi) and/or clean. - Check the comfort synchronising valve for the correct setting in accordance with the installation instructions.
	3. In the absence of positive results	Lime scale in plate heat exchanger. If necessary descale or replace

Temperature drop of the DHW (Combi)	1. Hot and cold water connection to the boiler mixed up	Check left = hot, right = cold
	2. Flow reducing valve.	Check flow reducing valve for the correct type in accordance with the installation instructions
	3. DHW power for the boiler is set too low.	<ul style="list-style-type: none"> - Check PARA chapter Step No. 43 - Check the functioning and wiring of the DHW sensor T3.

radiators do not get hot enough or warming them up takes too long	1. Check setting of room thermostat or RS100	See installation and user manual RS100
	2. Supply water temperature too low.	Check setting PARA chapter Step No. 1 and increase if necessary
	3. Incorrect choice of installation	PARA chapter Step No. 2 if necessary change.
	4. Installation resistance too high (given an average T > 36°F the boiler decreases the load).	<ul style="list-style-type: none"> - See installation instructions. - Check / clean water filter check dimensions of pipes.

Checking the O₂ Setting



NOTICE

The O₂ percentage setting is required to be checked at commissioning, maintenance and faults and adjusted if needed.



WARNING

The O₂ percentage is required to be checked and adjusted after a conversion from NG to LP or from LP to NG. This process must be done with a calibrated combustion analyzer that has been set to the correct gas type.

This can be checked by means of the following procedure:

- Remove the black cover of the gas valve by unscrewing the sealed screw.
- Put the boiler into operation and take care that it can deliver its heat;



Tip: If there is no demand for heat on CH, turn the hot water tap completely open and measure the O₂.





- Press the MODE-button for 5 seconds.

CODE

- The display will show CODE followed by an arbitrary number;

C123

- Select by means of the  or the  button the code C123;



- Press the Store-button to confirm the code (code blinks 1 x);



- Press the MODE-button until SERV is shown;

8 1 OFF


- Press the STEP-button once until 1 is shown; alternately 1 and OFF will be shown.

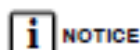
- Calibrate the O₂ meter ;



figure 27

- Place the probe of the O₂ meter into the check point (see fig. 27);

- Press the  button until the maximum value (in kW) is achieved; The boiler will burn on full load (value on display in kW) value in BTU/hr = x3415



NOTICE

When adjusting from max. to min. load it is advisable to stop at medium load to allow the boiler to stabilize. Adjusting quickly from max. to min. could force the boiler into an error state.



adjustment screw O₂ fig. 28

- Check the O₂ percentage:

Natural Gas:	full load:	between 4.4% and 4.7%
	min. load:	setting of full load +0.2% or greater
Propane:	full load:	between 4.6% and 5.1%
	min. load:	setting of full load +0.2% or greater

Example: Full load set on 4.6% O₂ (natural gas) then the minimum load setting should be 4.8% or greater.



NOTICE

Choose the right O₂ value according the kind of gas (Natural Gas or Propane Gas). Wrong adjustment may result causing property damage, personal injury or death.

- Let the O₂ meter do its measuring procedure.
- Adjust, if necessary, the adjustment screw to correct the O₂ value (see fig. 28). Allow boiler to stabilize before reading the new value.

Boiler Controls

The boiler is provided with a fully automatic microprocessor control, called CMS Control Management System. This control simplifies operation by undertaking all major control functions. Initially when power to the unit is switched on it will remain on standby. There is no indication LED on, until one of the program buttons is pressed. The control panel display will show the relevant state. When the installation is empty the display will show FILL.

The various parameters can be called up in two ways:

The Good-state or standard read out

The first way shows a simple display read out.

The boiler in operation will always show 'Good'. When a message is necessary this will be shown instead of Good.

Good

Technical read out

The second way is a technical read out. In normal situations the following will be shown:

- on the left the status in which the boiler is active;
- on the right the supply temperature in °F;

Alternately indicated by:

- the water pressure in the installation in PSI.




When a message (error or blocking code) is necessary this will be shown instead of the technical read out.

Example **0 66**

Example **P 18**

i NOTICE

To switch over from the Good-state to the Technical read out (and vice versa):
- Press the STEP-button for 5 seconds.

When the system has been filled the automatic de-aeration program starts, when a program has been selected, by pressing the button for Central Heating, DHW or pump program (,  or ). The program takes 17 minutes and stops automatically. After this the unit will function normally. (See also 'Filling and de-aerate the boiler and installation, chapter 9).

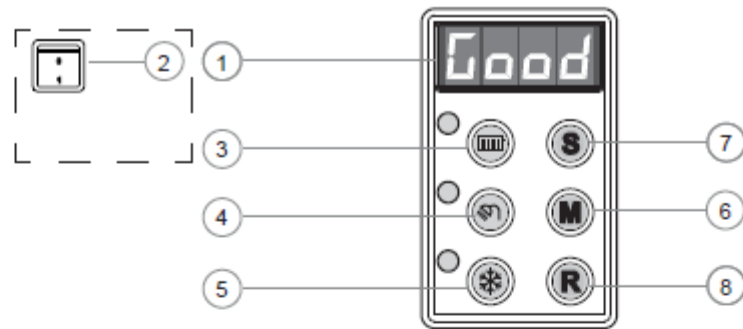
On a call for heating or hot water the control system will select the required water control temperature. This water temperature is called the T-set value. On a call for central heating the boiler ignites first at low input. The input is then changed slowly to match the load required. The boiler operates in this way to avoid excessive water noises and temperature overshoot. On a call for domestic hot water supply the T-set value of central heating return water temperature is monitored. Depending on the amount of domestic water which is withdrawn from the DHW facility, the central heating return water temperature, from which the input is adjusted, will vary.

Operation indication

(in the first display position by technical read out)

- | | |
|----------|--|
| 0 | No heat demand |
| 1 | Fan pre/post purge |
| 2 | Ignition phase |
| 3 | Burner active on central heating |
| 4 | Burner off while there is a demand for central heat or DHW |
| 5 | Fan check |
| 6 | Burner off when room thermostat is demanding or burner off when DHW is calling |
| 7 | Pump overrun phase for central heating |
| 8 | Pump overrun phase for hot water |
| 9 | Burner off because of too high flow temperature |
| A | Automatic de-aeration program |

Explanation of the function buttons



Boiler control panel

figure 24

NOTICE

Only qualified personnel who are trained for servicing these boilers are permitted to make alterations in the controller to calibrate the boiler to the installation.



1. Display. See previous page for further information.
2. ON-OFF Switch (Placed separately next to the boiler)
This switch turns the power supply to the boiler on or off.

CAUTION

Only turn the boiler off using this switch, when the burner is off..



3. Central Heating program button.
Switching the Central Heating on or off (LED on/off);
4. Hot Water program button.
Switching the Domestic Hot Water (DHW) facility on or off (LED on/off);
5. Pump program button. This LED should never be left on.
adjusts the pump to continuous water circulation in the central heating system (LED on), or according to the pump overrun times on the relevant programs (LED off);

NOTICE

When the pump is switched on continuously it can lead to undesired heating up of the central heating system during the summer.

- 6 Mode-button.
*After briefly pressing, a selection of the data chapters can be retrieved.
After pressing for 5 seconds it is possible to enter the code as described in chapter 11.3;*
- 7 Step-button.
*After briefly pressing, the water pressure can be retrieved and pages per chapter can be retrieved.
After pressing for 5 seconds it switches from the Good-state to technical read out and vice versa;*
- 8 Reset-button.
After briefly pressing, for:
- unlocking errors;
- ending the access code:

Pressing R or the reset button for more than 5 seconds will activate a 17 minute de-aeration cycle.

Some buttons have other functions. These functions are only active when according to the procedure described in chapter 10, adjustment has to be changed or data must be retrieved from the CMS. The other functions are:

3. Central Heating program button : + function;
4. Hot Water program button: - function;
5. Pump program button : store-function, which means that by means of this button a modified setting is confirmed; scrolling in a data chapter.
7. Step-button:

Starting up: Filling and de-aerating the boiler and installation



CAUTION

CAUTION

Observe the following rules of safety:

- All work on the unit must take place in a dry environment.
- Rinnai units may never be in operation without their housing, except in connection with maintenance or adjustments (see Chapter 12 and 13).
- Never allow electrical or electronic components to come into contact with water.



NOTICE

NOTICE

Carry out the following tasks in connection with maintenance, etc. to an already-installed unit:

- Shut down all programs
- Close the gas shut off valve
- Shut off the power at the main power switch
- Close the service valves (system supply and return)



NOTICE

NOTICE

Take note of the following when maintenance or adjustments are needed:

- The unit must be able to function during these activities; for this reason, the unit's supply voltage, gas pressure and water pressure must be maintained. Ensure that this is not a source of potential danger during these activities.



WARNING

Following maintenance or other activities; always check the installation of all parts through which gas flows (with bubble test using leak-search spray).

Requirements of the water system

Before filling the heating system, the complete system, including all zones, must be thoroughly cleaned and flushed to remove sediment. Flush until clean water runs free of sediment. Rinnai suggests using an approved system cleaner to flush the system, but not the boiler. Always use Rinnai approved antifreezes. See the list at the end of this chapter. Never use reverse osmosis, D.I., or distilled water for filling the heating system.



WARNING

Do not use petroleum-based cleaning or sealing compounds in the boiler system. Damage of seals and gaskets in boiler and system could occur, resulting in substantial property damage.

The central heating installation needs to be filled with potable water.



WARNING

Use only potable water or approved glycol for filling the heating system. When the water hardness of the filling water exceeds > 10.5 gpg (200 mg/L) and the volume of the installation > 20L/kW (5.2 gallons/3,412 BTU) the water has to be treated until below the maximum value of 10.5 gpg (200 mg/L). The pH value of the installation water must be between 6.5 and 8.5.

Check the pH value using proper equipment or by having the water analyzed by a water treatment company.

If pH differs from above, contact Rinnai engineering for further assistance.



NOTICE

Failure to adhere to the water quality requirements will void the warranty.

Freeze protection

Freeze protection for new or existing systems must use glycol that is specially formulated for this purpose. This includes inhibitors, which prevent the glycol from attack the metallic components. This should be for multi-metallic components.

Make certain to check that the system fluid is correct for the glycol concentration and inhibitor level. The system should be tested at least once a year and as recommended by the producer of the glycol solution. The allowed maximum concentration is 50%.



NOTICE

Use only Rinnai approved inhibitors. See below for an approved list of inhibitors.



WARNING

Use only inhibited propylene glycol solutions, which are specially formulated for central heating systems. Ethylene glycol is toxic and can attack gaskets and seals used in the boiler and system. Approved glycols are listed below.



NOTICE

Additives in the installation water are not permitted.

Approved antifreeze: • Rhomar RhoGard Mutli-Metal (AL safe) • Sentinel X500
(max. concentration 50%) • Noble Noburst AL • Fernox Alphi 11

Approved system cleaner: • Noble Noburst Hydronic System Cleaner • Fernox F3 Cleaner
• Rhomar Hydro-Solv 9100 • Sentinel X400

















NOTICE

The system cleaners from NoBurst, Rhomar, and Fernox are not to be used in the boiler. The boiler must be closed off (valved off) from the rest of the system or not connected while the cleaners are in the system. The system should then be drained and then thoroughly flushed with clean water to remove all the system cleaner.

Approved inhibitors: • Rhomar Pro-tek 922 • Sentinel X100
• Noble Noburst AL inhibitor

Filling the heating system

For filling or topping off the installation you use the filling loop according to the following procedure:

- 1 Switch on the power supply;
 - 2 The display will show FILL;

 - 3 All functions off (heating , DHW  and pump 
 - 4 Push briefly the 'STEP'-button: P XX (XX = water pressure in PSI);

 - 5 Open the filling loop (Indication on display increases);
 - 6 Fill up slowly to 16 to 18 PSI (1.1 and 1.3 bar);

 - 7 STOP appears on the display;

 - 8 Close the filling loop;
 - 9 De-aerate the complete installation, start at the lowest point;
 - 10 Check the water pressure and if necessary top it up;
 - 11 Close the filling loop;
 - 12 Activate the functions in use (heating , DHW  and/or pump 
- Note: You must have either a hot water or heat demand to activate de-aeration
- 13 If A XX appears on the display, wait for 17 minutes;

 - 14 Check the water pressure and if necessary top it up to 16 to 18 PSI (1.1 and 1.3 bar)
 - 15 Close the filling loop;
 - 16 Press the 'STEP'-button;

 - 17 Be sure that the filling loop is closed.
 - 18 After the automatic de-aeration program (A XX) is finished the boiler will return to the Good state or Technical read out.
 

Check the water pressure regularly and top off the installation when necessary. The working pressure of the installation should be between 16 and 18 PSI when the system is cold. Adjust your auto-feed to 16 – 18 PSI.

NOTICE

It can take a while before all air has disappeared from a filled installation. Especially in the first week noises may be heard which indicate the presence of air. The automatic air vent in the boiler will remove this air, which means the water pressure can reduce during this period and therefore topping off with water will have to be done.

During normal use the following messages can occur with the necessary follow up:

FILL

Water pressure is too low (<10 PSI / 0.7 bar), FILL indication remains continuously visible, the boiler is taken out of operation. The installation needs to be topped off.

FILL

Water pressure is too low (<12 PSI / 0.8 bar), flashing FILL will alternate with indication of water pressure, boiler power of 50% is possible. The installation needs to be topped off.

HIGH

Water pressure is too high (>42 PSI / 3 bar), if HIGH indication remains continuously visible, the boiler is taken out of operation. The installation pressure needs to be decreased by draining water.

Altering adjustments

STEP 1 Press the **Mode**-button for 5 seconds.

The display shows COdE followed by an arbitrary number;

STEP 2 Press by means of the **+** or the **-** button until the code **C123** is shown;

STEP 3 Press the **STORE**-button to confirm the code (code blinks 1 x).

Now you have access to the installer level. There are 4 chapters:

- **PARA** Parameters
- **INFO** Information chapter (no adjustments possible)
- **SERV** Service chapter
- **ERR0** Error-chapter (no adjustments possible)

The content of the chapters is described on the following pages.

STEP 4 Press briefly the **MODE**-button to select one of the 4 chapters, i.e. **PARA**;

STEP 5 Press briefly and release the **STEP**-button to select a Parameter
(parameter visible on the left, value on the right) ;

STEP 6 Alter the value, if necessary/possible, by means of the **+** or the **-** button

STEP 7 Press briefly on the **STORE**-button to confirm the alteration.
When you have to change more values, repeat from step 5.

STEP 8 Press once or more on the **MODE**-button until **StBY** or **Good** is shown:
After a few seconds the text StBY will be replaced by the technical read-out or Good-state (Depending from the position the access code is entered)
When you want to return from an arbitrary position to the original read out press once or more on the MODE-button until StBY is shown.



NOTICE

If no single button is used within 20 minutes the display will return automatically to its original read-out (Good state or technical read out)

Parameter Mode			
PARA	FACTORY	DESCRIPTION	RANGE
1	176°F	maximum supply temperature CH	68 - 176°F
2*	00	type of CH installation:	00 - 04
		No pre-selection made.	00
		Radiators, air heating, or convectors:	
		T max. supply 176°F K factor heating curve 2.3; gradient 10°F/min; gear differential 10°F	
			01 DO NOT USE
		radiators with large surface areas or underfloor heating as additional heating:	02
		T max. supply 158°F K factor heating curve 1.8; gradient 10°F/min; gear differential 10°F	
		under floor heating with radiators as additional heating:	03
		T max. supply 140°F; K factor heating curve 1.5; gradient 8°F/min; gear differential 8°F	
		full under floor heating:	04
		T max. supply 122°F; K factor heating curve 1.0; gradient 6°F/min; gear differential 6°F	
3	max.	maximum power CH in kW (... x3415 = ... BTU/hr)	min-max
4*	00	control principal with on / off thermostat:	
		100 % on / off thermostat	00
		constant water circulation 22&23 closed contact day curve operation, open contact night curve operation	01
5*	2.3	heating curve K-factor (see also heating curve graph)	0.2 - 3.5
6*	1.4	heating curve exponent (see also heating curve graph)	1.1 - 1.4
7*	14°F	heating curve climate zone (see also heating curve graph)	-4 - 32°F
10*	0°F	fine adjustment heating curve day temperature	-8 to 10°F
11*	0°F	fine adjustment heating curve night temperature	-8 to 10°F
14	10°F/min.	gradient speed °F/min.	0 - 28°F/min.
15*	00	Booster after night decrease*:	
		no	00
		yes	01
23	26°F	Frost Temperature	-4 to 50°F
27	32°F	Minimum T-set CH	0 - 158°F
36	10	Type of three way valve and DHW facility	
		VC 2010 / VC 8010	x0
		Warming function plate heat exchanger ON	1x
		Warming function plate heat exchanger OFF	2x
43	max.	Maximum power DHW in kW (... x3415 = ... BTU/hr)	min-max
49	100%	Maximum pump capacity heating	100 %
73	0	Altitude and venting CFT. See chapter 6.7.7	0 - 100
89	00	Address	
		No function	-01
		Bus thermostat	00
90	01	Display reading	
		°C and Bar	00
		°F and PSI	01

PARA 36 E Combi. setting definitions

00 = activation by temperature drop for DHW (no plate warming)

10 = activation by temperature drop for DHW (plus plate warming)

20 = flow switch activation only DHW. (No plate warming/ no temp actuation)

In either setting above - 00 or 10 the Flow switch is still in the circuit and if it sticks "closed" it can keep the boiler locked in DHW and code 6 will appear on the screen. Unplug flow switch as it is not needed. (Do not waste time taking switch out and cleaning it, just unplug it electrically)

PARA 36 Q combi

01 = factory setting-load sharing "on"

00 = Alternate setting - Load sharing "off" (MCBA thinks a "grey" non-modulating valve is being used in place of the "Black" modulating valve) All other combinations are NOT to be used on O-combi boilers)

Info Mode			
INFO	FACTORY	DESCRIPTION	RANGE
1	°F	supply water temperature T1	
4	°F	return water temperature T2	
5	°F	DHW temperature T3	
7	°F	outdoor temperature T4	
8	°F	flue gas temperature T5 (optional sensor)	
16	%	actual power in %	
17	kW	actual power in kW (... x3415 = ... BTU/hr)	
18	kW	actual load in kW (... x3415 = ... BTU/hr)	
20		indication bus communication	
21	GJ	consumption total in GJ (... x 33 = ... m3)	
22	GJ	consumption CH in GJ (... x 33 = ... m3)	
23	GJ	consumption DHW in GJ (... x 33 = ... m3)	
24	h	total number of burner run hours	
25	h	number of burner run hours CH	
26	h	number of burner run hours DHW	
32	h	total number of hours counter	
37	h	total number of run hours pump CH and DHW	
46	h	within how many hours is service required	

Service Mode			
SERV	VALUE	DESCRIPTION	RANGE
1	OFF	boiler in operation with burner function on	OFF - max.
2	OFF	fan adjustable and burner off	OFF - max.
3	OFF	pump adjustable with burner on	OFF - max.
4	OFF	showroom position ON = active and OFF = non active	ON - OFF

Error Mode		
ERRO	VALUE	DESCRIPTION
Err.L - Err.5		Last saved error until 5 last previous errors
1		error code
2		operation status boiler
3	°F	supply water temperature T1
4	°F	return water temperature T2
5	kW	load (... x3415 = ... BTU/hr)
6	%	pump capacity

Parameter-, Info-, Service- and Error-chapters

Activating factory settings (Green button function)

To activate the factory settings again please follow the next procedure (Note: all altered adjustments will be set back to their original factory settings that are accessible in the current service level the boiler is in either user or 123):






- Select, when necessary, the technical read out;
- Select with the MODE-button chapter PARA;
- Press the STORE-button.

The word "Copy" will appear and the factory settings are active again.

Isolating the boiler



Some situations require turning the entire boiler off.

By switching off the three buttons with the LED's for central heating, hot water and pump program ( ,  or ), the boiler is switched off. Do not shut off the power of the boiler, which means the circulation pump and the three-way valve are activated once every 24 hours in order to prevent these parts from seizing up.



CAUTION

In the event of frost danger during an isolated boiler it is advisable to drain the boiler and/or the installation.

Reset service interval counter

At 4000 hours of use, "SERVICE" will scroll across the display. "Good" will display as well alternatively.

To reset the 4000 hour service notification:

 CODE 123

- Enter the 1st Tier Settings: 123 Code



 SERV

- Briefly press "Mode" again until the Service Chapter is displayed (SERV)



 SERV

- Hold the "Store" button until SERV flashes once—the service notification will no longer show during normal operation and the countdown to service will reset to 4000.